

NEW DISTRIBUTION RECORDS OF MOSQUITOES (DIPTERA: CULICIDAE) FOR YUCATÁN, MEXICO¹

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ABSTRACT: As part of the West Nile Virus Emergence Program in Yucatán, carried out by the Mexican Ministry of Health, an extensive mosquito larvae survey was made throughout urban, suburban and rural localities within 66 municipalities of this Mexican State. Larval collections (2623 samples) from domiciliary and peridomiciliary habitats were made from August to December 2003 (rainy season). New municipality distribution records were established for 16 mosquito species. *Psorophora howardii* was recorded for Yucatán State for the first time. *Ae. aegypti* was the most widely distributed species, and was recorded in almost all the municipalities sampled, followed by *Culex coronator*; *Cx. nigripalpus*, *Cx. quinquefasciatus*, *Cx. interrogator* and *Cx. thriambus*. A wide variety of habitats, natural or manmade, were found positive for mosquitoes, the most common being buckets, rock holes, water storage tanks, and laundry or kitchen items, all of which hosted a large number of different species.

KEY WORDS: Diptera, Culicidae, Mexico, Yucatán, new distribution records

Published contributions to the knowledge of mosquito fauna of the Mexican state of Yucatán (N 21°36', S 19°32' latitude; E 87°32', W 90°25' longitude) are scarce and geographically restricted. In the most recent document about mosquitoes of Mexico that specifically mentioned the species richness of Yucatán, Ibáñez-Bernal et al. (1996) reported forty-five species, but did not include detailed information about localities and species distribution. Other published literature about the mosquito fauna of Yucatán reports the presence of approximately 50 species (Vargas, 1956; Díaz-Nájera and Vargas, 1973; Ibáñez-Bernal and Martínez-Campos, 1994; Rivas et al., 2000). The majority of these reports only refer to "Yucatán" or the Municipality of Mérida, the location of the capital city of Yucatán State, yet there are 105 additional municipalities within the state.

Historically, mosquito studies in Yucatán have been primarily directed towards the control of *Aedes aegypti* and Dengue virus transmission or the reduction of nuisance biting. Recently the potential emergence of West Nile virus (WNV) in the area has resulted in a renewed interest in entomology in the state. Yucatán is considered a likely point of incursion of this virus into Latin America because it is a principal landfall for many species of birds that migrate from the

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Northeastern and Midwestern United States (Loroño-Pino et al., 2003). In response, the Mexican Ministry of Health established an entomological surveillance program in the state in order to get a more precise picture of the distribution of mosquito fauna in the different localities of Yucatán.

METHODS

As part of the WNV Emergence Program in Yucatán, carried out by the Mexican Ministry of Health, an extensive mosquito larvae survey was conducted in premises throughout urban, suburban, and rural localities within 66 municipalities between August and December 2003, during the rainy season. Due to time constraints all localities were visited at least once during the study period, and no attempt was made to count habitats without larvae. Upon entering the collection site, inspectors visually scanned the area for containers or other potential habitats for larval development, and then examined all of them for larvae. Larvae found in small containers were collected either by use of a zooplankton net or pipetted with a turkey baster. In larger breeding sites, larvae were collected by sweeping the surface of the water with a net for aquatic insects. Inspectors collected only a sample of larvae from each collection site.

From domiciliary and peridomiciliary containers and other habitats positive for mosquito larvae, 2,623 samples were collected and preserved in vials with ethanol 70 percent and subsequently transported to the Servicios de Salud of Yucatán headquarters or the Zoology Laboratory of the Universidad Autónoma de Yucatán. Specimens from each sample were examined in alcohol using a dissecting scope, separated, and identified using the keys by Clark-Gil and Darsie (1983) and Ibáñez-Bernal and Martínez-Campos (1994). Samples of the specimens, mounted on slides, are deposited in the Colección Entomológica Regional (CER) of the Universidad Autónoma de Yucatán.

RESULTS AND DISCUSSION

A list of mosquito larvae species is presented here, along with their spatial distribution (presence or absence) at the municipality/locality level of urban, suburban and rural areas of Yucatán, Mexico. The number of specimens examined is not available for all locations, and is therefore not included. However, at least one specimen of each species had to be present for a locality to be considered positive. Municipalities are given in uppercase, followed by the locality and the date of collection. When known, the neighborhood (“colonia,” “barrio,” or “fraccionamiento”) is mentioned, and the longitude/latitude coordinates for each locality are given for all locations.

The larval collections in the Mexican state of Yucatán during the rainy season of 2003 established new municipality distribution records for 16 species. *Psorophora howardii* is first reported for Yucatán State. *Ae. aegypti*, the most widely distributed species, was recorded in 98.5 percent of the municipalities, followed by *Culex coronator*, *Cx. nigripalpus*, *Cx. quinquefasciatus*, *Cx. interrogator* and

Cx. thriambus. The remaining species were only registered for less than one third of the municipalities. It was not possible to identify some specimens, like *Toxorhynchites* and *Wyeomyia*, to species level, nor was it possible to clearly differentiate between *Cx. corniger-lactator* specimens with the identification keys used.

The breeding sites where samples of each species were collected are listed in Table 1. Breeding sites were classified in three groups: natural, nonessential, and useful (Pan American Health Organization, 1994). The second and third group includes manmade containers or artificial water bodies. Although a wide variety of types of containers were observed, they were grouped under representative names. Most of the names used to typify the containers are commonly used and known in the mosquito literature.

As evident from Table 1, most of the species reported were found breeding in a wide variety of containers, natural or manmade, useful or nonessential, but also in other habitats like temporary pools, ponds and marshes. *Ae. aegypti*, *Cx. quinquefasciatus*, *Cx. interrogator* and *Cx. thriambus* were the species most commonly observed in all the types of breeding sites.

All breeding sites, whether natural, nonessential, or useful, harbored significant species diversity. However, buckets, rock holes, water storage tanks, and laundry or kitchen utensils reported a larger diversity of species and were also the most common habitats positive for mosquito larvae. Although no data regarding productivity (population density or abundance) of the breeding sites is available, it appears that any control effort against mosquitoes should incorporate not only solid waste and environmental management (destruction, alteration, disposal or recycling of containers and natural habitats), but also the improvement of water supply and storage.

Subfamily Anophelinae

Anopheles (Nyssorrhynchus) albimanus Wiedemann

Material Examined: HOCTÚN: Hoctún (N 20°51'12.11", W 89°11'53.34"), 10 Nov 2003; MÉRIDA: Dzityá (N 21°2'38.29", W 89°40'28.03"), 24 Nov 2003; MÉRIDA (N 20°58'12.94", W 89°36'59.97"), 3 Dec 2003; PROGRESO: Chicxulub Puerto (N 22°16'23.35", W 89°35'40.93"), 23 Sep 2003.

Subfamily Culicinae

Tribe Aedini

Aedes (Stegomyia) aegypti (L.)

Material Examined: ACANCEH: Acanceh (N 20°48'12.33", W 89°27'5.42"), 14 Nov 2003; AKIL: Akil (N 20°16'1.76", W 89°21'25.23"), 7 Oct 2003; BOKOBÁ: Bokobá (20°59'21.71", W 89°10'32.94"), 8 Sep 2003, 10-11 Oct 2003, 10-11 Nov 2003; BUCTZOTZ: Buctzotz (N 21°10'31.16", W 88°46'54.88"), 30 Sep 2003, 13-14 Oct 2003; CACALCHÉN: Cacalchén (N 20°58'1.45", W 89°13'14.22"), 11 Sep 2003; CANSAH CAB: Cansahcab (N 21°8'15.14", W 89°5'34.86"), 18 Dec 2003; CANTAMAYEC: Cantamayec (N 20°28'3.7", W 89°4'54.87"), 2, 4-5, 8 Sep 2003, Cholul (N 20°26'22.03", W 89°9'31.59"), 20 Oct 2003; CALOTMUL: Pocoboch (N 20°56'47.34" W 88°6'14.82"), 4 Nov 2003; CELESTÚN: Celestún (N 20°52'16.97", W 90°23'48.88"), 4, 6-7 Oct 2003; CHACSINKÍN: Chacsinkín (N 20°10'15.98", W 89°1'18.30"), 11-12, 15 Sep 2003; CHAPAB: Citincabchén (20°31'35.71", W 89°32'23.81"), 4 Sep 2003, 27 Oct 2003; CHEMAX: Chemax (N 20°37'52.63", W 87°55'41.93"), 2 Sep 2003, 24 Dec 2003, Sisibichén (N 20°48'0.28", W

87°54'46.75"), 10 Nov 2003, Xalau (N 20°39'31.65", W 88°05'46"), 3 Nov 2003, 8 Dec 2003; CHICHIMILÁ: Chichimilá (N 20°36'44.09", W 88°12'41.87"), 1-2 Oct 2003; CHIKINDZONOT: Chikindzonot (N 20°19'26.13", W 88°29'9.60"), 11 Sep 2003; CHOCHOLÁ: Chocholá (N 20°45'15.09", W 89°50'1.98"), 9 Sep 2003, 8 Dec 2003; CHUMAYEL: Chumayel (N 20°25'40.33", W 89°18'20.50"), 23-24, 29 Aug 2003, 2-4, 22, 29 Sep 2003, 10, 14-16 Oct 2003; CONKAL: Conkal (N 21°3'44.55", W 89°30'53.06"), 8, 10 Sep 2003; CUNCUNUL: Cuncunul (N 20°37'17.06", W 88°17'33.36"), 22 Oct 2003; DZAN: Dzan (N 20°23'30.65", W 89°28'30.18"), 29 Oct 2003; DZEMUL: Dzemul (N 21°11'29.77", W 89°18'10.28"), 10 Dec 2003; DZIDZANTÚN: Dzidzantún (N 21°13'27.27", W 89°1'55.32"), 10 Sep 2003, 15 Oct 2003; DZILAM GONZÁLEZ: Dzilam González (N 21°15'19.45", W 88°55'0.97"), 11 Dec 2003; DZILAM DE BRAVO: Dzilam de Bravo (N 21°21'0.76", W 88°52'51.67"), 11 Dec 2003; DZITÁS: Dzitás (N 20°49'7.58", W 88°31'21.76"), 17 Sep 2003, 23 Oct 2003, Xocempich (N 20°45'8.11", W 88°34'1.61"), 27 Nov 2003; ESPITA: Espita (N 20°58'56.07", W 88°17'51.38"), 5, 13 Nov 2003; HALACHÓ: Chuc-Holoch (N 20°28'5.18", W 90°6'45.75"), 17 Sep 2003, Halachó (N 20°29'35.62", W 90°5'26.89"), 17, 27 Sep 2003; HOCABÁ: Hocabá (20°48'11.64", W 89°14'39.12"), 19 Sep 2003; HOCTÚN: Hoctún, 10 Nov 2003; HUNUCMÁ: Hunucmá (N 21°00'56.56", W 89°52'25.88"), 29 Sep 2003; IZAMAL: Izamal (N 20°55'3.41", W 89°00'46.41"), 1 Sep 2003; KAUA: Kauga (N 20°36'16.89", W 88°24'35.40"), 18 Sep 2003; KANASÍN: Fraccionamiento Héctor Victoria, 30 Oct 2003, Kanasín (N 20°55'51.07", W 89°32'57.75"), 14 Aug 2003, 1 Oct 2003; KANTUNIL: Holcá (N 20°44'35.82", W 88°55'41.65"), 25 Sep 2003; KOPOMÁ: Kopomá (N 20°39'15.41", W 89°54'15.55"), 26 Sep 2003, 8 Dec 2003; MANÍ: Maní (N 20°23'18.00", W 89°23'48.57"), 18 Aug 2003, 25 Sep 2003, 27-28 Nov 2003, 1-3 Dec 2003, Tipikal, 10 Dec 2003; MÉRIDA: Colonia Amalia Solórzano, 30 Sep 2003, 1-2 Oct 2003, Colonia Amapola, 12, 18 Nov 2003, Colonia Benito Juárez, 23 Sep 2003, Colonia Buenavista, 19 Nov 2003, Camara Construcción, 2 Dec 2003, Caucel, 4 Sep 2003, Centro, 13 Oct 2003, 10-11, 13, 24, 26-27 Nov 2003, Fraccionamiento Chenkú, 24, 27-28 Nov 2003, Colonia Chichén Itzá, 25-26, 29 Sep 2003, 8 Dec 2003, Cholul, 4 Sep 2003, 11 Nov 2003, Colonia Azcorra, 12 Sep 2003, Mérida, 21 Nov 2003, Colonia Sarmiento, 8 Oct 2003, Dzityá, 8 Oct 2003, Fraccionamiento Francisco de Montejo, 19 Nov 2003, Colonia Itzimmá, 12 Dec 2003, Fraccionamiento Juan Pablo, 15 Dec 2003, Fraccionamiento Juan Pablo Ote, 22 Sep 2003, Fraccionamiento Lindavista, 17, 24 Nov 2003, Fraccionamiento Magnolias, 21 Nov 2003, 1 Dec 2003, Colonia Nueva Chichén, 23 Sep 2003, Fraccionamiento Pedregales de Tanlum, 17 Nov 2003, Fraccionamiento Residencial Pensiones, 16-17 Oct 2003, Fraccionamiento Terranova, 21, 28 Nov 2003, Fraccionamiento Vergel, 30 Aug 2003, 11 Sep 2003, 4-5, 8-9 Dec 2003, Fraccionamiento Vergel I, 5 Dec 2003, Fraccionamiento Vergel II, 8 Sep 2003, 25 Oct 2003, 25 Nov 2003, 3-5, 7, 11 Dec 2003, Fraccionamiento Vergel III, 3-5, 8-9 Dec 2003, Fraccionamiento Vergel IV, 9, 11 Dec 2003, Fraccionamiento Vergel V, 9 Dec 2003, Fraccionamiento Vergel 65, 5, 9 Dec 2005, 11 Sep 2003, Colonia Vicente Guerrero, 2 Oct 2003, Colonia Vicente Solís, 15 Sep 2003; MUXUPIP: Muxupip (N 21°1'49.42", W 89°19'21.30"), 18 Sep 2003, 27 Nov 2003; OPICHEN: Calcehtok (N 20°34'41.52", W 89°55'12.78"), 20 Aug 2003; OXKUTZCAB: Cooperativa (N 20°13'57.38", W 89°28'35.95"), 9 Oct 2003, 12-14, 16, 18 Nov 2003, Xohuayán (N 20°11'22.81", W 89°23'9.99"), 13 Nov 2003, Yaxhachén (N 20°3'44.63", W 89°34'41.88"), 6-7, 11-12 Nov 2003; PETO: Peto (N 20°7'38.87", W 88°55'31.98"), 12, 16-17 Sep 2003; PROGRESO: Chicxulub Puerto, 9 Aug 2003, 9 Sep 2003, Chuburná Puerto (N 21°14'28.64", W 89°47'47.70"), 19 Sep 2003, Fraccionamiento Campestre Flamboyanes, 18 Sep 2003, Progreso (N 21°15'59.17", W 89°39'14.39"), 2 Oct 2003, Hacienda San Ignacio (N 21°8'36.94", W 89°39'2.61"), 29 Aug 2003; RÍO LAGARTOS: Río Lagartos (N 21°33'17.86", W 88°8'33.36"), 12 Nov 2003; SAMAHIL: San Antonio Tedzidz (N 20°53'5.85", W 89°53'16.60"), 27 Oct 2003; SANTA ELENA: Santa Elena (N 20°20'7.11", W 89°39'5.08"), 10, 23-26 Sep 2003; SOTUTA: Sotuta (N 20°35'20.19", W 89°0'25.21"), 20 Oct 2003, Tibolón (N 20°39'25.52", W 88°56'23.37"), 21 Oct 2003; SUMA: Suma (N 21°3'58.35", W 89°8'28.28"), 3 Sep 2003; TAHDZIÚ: Tahdziú (N 20°12'9.95", W 88°56'55.07"), 18-19, 24 Sep 2003; TAHMEK: Tahmek (N 20°51'53.29", W 89°15'15.65"), 5, 9, 13-14 Oct 2003, 3, 5-7, 9, 12 Nov 2003; TEABO: Teabo (N 20°23'56.09", W 89°17'13.64"), 21-22, 26, 18 Aug 2003, 10, 14-15, 24 Oct 2003; TEKANTÓ: Tekantó (N 20°59'36.62", W 89°6'0.70"), 9 Sep 2003; TEKAX: San Isidro Maquian (N 19°50'43.17", W 89°25'53.13"), 2 Sep 2003, Huntochac (N 19°49'19.66", W 89°30'52.65"), 3 Sep 2003, Tekax (N 20°12'26.24", W 89°17'51.99"), 19 Sep 2003, Kinil (N 20°19'21.92", W 89°8'16.49"), 1 Oct 2003, Pencuyut (N 20°17'41.47", W 89°17'53.06"), 1-2, 7 Oct 2003, Xayá (N 20°17'42.62", W

89°11'29.91"), 1-3, 5-7, 9 Oct 2003, Kancab (N 20°11'40.63", W 89°20'56.25"), 6-7, 25 Nov 2003, San Pedro Xtoquil (N 19°46'6.85", W 89°26'40.76"), 27 Aug 2003; TEKIT: Tekit (N 20°31'56.92", W 89°20'5.22"), 18 Nov 2003; TEKOM: Tekom (N 20°35'9.65", W 88°15'35.95"), 22-24 Sep 2003; TELCHAC PUEBLO: San Crisanto (N 21°19'32.13", W 89°9'46.34"), 10 Oct 2003; TEMAX: Temax (N 21°7'39.50", W 88°55'45.03"), 13 Nov 2003; TICUL: Colonia Obrera, 13-14, 17 Nov 2003, Barrio Guadalupe, 10 Oct 2003, 17 Nov 2003, Kinder, 3 Nov 2003, Barrio Mejorada, 12 Nov 2003, Pustunich (N 20°22'26.22", W 89°31'0.31"), 29 Sep 2003, 6 Oct 2003, Barrio San Enrique, 3 Nov 2003, Barrio San Juan, 13, 15 Nov 2003, Colonia San Joaquín, 22 Sep 2003, 31 Oct 2003, Barrio San Román, 7-8, 10-11, 24 Nov 2003, Barrio Santiago, 4-7 Nov 2002, Ticul (N 20°24'9.21", W 89°32'32.43"), 5-6, 10, 29-30 Sep 2003, 27, 30 Oct 2003, 3-4, 7, 12 Nov 2003, Yotholin (N 20°19'45.02", W 89°27'37.78"), 29-30 Oct 2008, 13, 15 Oct 2003; TINUM: Piste (N 20°40'56.30", W 88°35'4.87"), 20 Oct 2003; TIXCACALCUPUL: Tixcacalcupul (N 20°31'19.78", W 88°15'50.83"), 24 Sep 2003; TIXKOKOB: Ekmul (N 20°57'8.97", W 89°20'43.95"), 22 Sep 2003, 1-3 Dec 2003, Tixkokob (N 20°59'17.24", W 89°23'24.73"), 20 Nov 2003; TIXMEHUAC: Chicam (N 20°20'15.34", W 89°9'41.45"), 24 Oct 2003, Kimbilá (N 20°17'40.13", W 89°5'25.71"), 24 Oct 2003; TIZIMÍN: Popolnah (N 20°57'46.94", W 87°33'4.35"), 3 Sep 2003, Tizimín (N 21°6'49.32", W 88°8'27.54"), 5-6, 11, 17-19, 24-25 Nov 2002, 1-2, 10 Dec 2003; TZUCACAB: Tzucacab (N 20°4'30.20", W 89°3'15.58"), 29 Aug 2003; UAYMA: Uayma (N 20°41'52.58", W 88°18'35.16"), 15 Aug 2003, 10, 15 Sep 2003; UMÁN: Umán (N 20°52'43.80", W 89°44'47.03"), 5, 8-9 Sep 2003; VALLADOLID: Valladolid (N 20°40'7.73", W 88°11'58.45"), 25 Sep 2003, 9 Oct 2003, 4, 26 Nov 2003; XOCHEL: Xocchel (N 20°49'16.29", W 89°10'54.01"), 19 Sep 2003; YAXCABA: Libre Unión (N 20°41'39.78", W 88°48'24.86"), 9 Dec 2003, Yaxunáh (20°31'46.58", W 88°40'25.50"), 7 Oct 2003; YAXKUKUL: Yaxkukul (N 21°2'58.86", W 89°24'39.33"), 18 Oct 2003.

Haemagogus (Haemagogus) anastasionis Dyar

Material Examined: CHUMAYEL: Chumayel, 10, 17 Oct 2003; KANTUNIL: Holcá, 25 Sep 2003; KOPOMÁ: Kopomá, 8 Dec 2003; MANÍ: Maní, 28 Nov 2003; MÉRIDA: Dzityá, 8 Oct 2003; OXKUTZCAB: Cooperativa, 13-14 Nov 2003; SOTUTA: Sotuta, 20 Oct 2003; TAHDZIÚ: Tahdziú, 30 Sep 2003; TAHMEK: Tahmek, 6-7 Nov 2003; TEKAX: Xayá, 3 Oct 2003; TEMAX: Temax, 3 Nov 2003; TICUL: Colonia Obrera, 14 Nov 2003; TIXCACALCUPUL: Tixcacalcupul, 25 Sep 2003; TIXKOKOB: Ekmul, 2-3 Dec 2003; TIZIMÍN: Tizimín, 11 Nov 2003; YAXKUKUL: Yaxkukul, 18 Oct 2003.

Haemagogus (Haemagogus) equinus Theobald

Material Examined: CHACSINKÍN: Chacsinkín, 15 Sep 2003; CHAPAB: Citincabchén, 4 Sep 2003; CHEMAX: Kuxeb (N 20°49'47.33", W 87°51'49.32"), 24 Nov 2003; CHUMAYEL: Chumayel, 10, 15, 17 Oct 2003; CUNCUNUL: Cuncunul, 22 Oct 2003; HOCABÁ: Hocabá, 19 Sep 2003; MANÍ: Maní, 27 Nov 2003, 1 Dec 2003; MÉRIDA: Dzityá, 8 Oct 2003; OXKUTZCAB: Xohuayán, 13 Nov 2003, Yaxhachén, 12 Nov 2003; SANTA ELENA: Santa Elena, 26 Sep 2003; SOTUTA: Sotuta, 20 Oct 2003; TAHDZIÚ: Tahdziú, 30 Sep 2003; TAHMEK: Tahmek, 14 Oct 2003; TEABO: Teabo, 21 Aug 2003; TEKAX: Mesatunich (N 19°49'39.36", W 89°25'45.94"), 2 Sep 2003, Xayá, 3, 9 Oct 2003; TICUL: Colonia Obrera, 13 Nov 2003, Pustunich, 29 Oct 2003, Barrio San Juan, 7 Nov 2003, Ticul, 6 Nov 2003, Yotholin, 15 Oct 2003; TIXKOKOB: Ekmul, 2 Dec 2003; TIZIMÍN: Tizimín, 17 Nov 2003; UAYMA: Uayma, 15 Oct 2003; YAXKUKUL: Yaxkukul, 18 Oct 2003.

Haemagogus (Haemagogus) mesodentatus Komp and Kumm

Material Examined: TAHDZIÚ: Tahdziú, 30 Sep 2003.

Ochlerotatus (Ochlerotatus) scapularis (Rondan)

Material Examined: ACANCEH: Acanceh, 14 Nov 2003; CHACSINKÍN: Chacsinkín, 15 Sep 2003; CHAPAB: Citincabchén, 4 Sep 2003; HOCTÚN: Hoctún, 10 Nov 2003; OXKUTZCAB: Cooperativa, 13-14 Nov 2003, Yaxhachén, 10-12 Nov 2003; SOTUTA: Sotuta, 20 Nov 2003, Tibo-

lón, 21 Oct 2003; TAHZDIÚ: Tahdziú, 30 Sep 2003; TAHMEK: Tahmek, 9, 12, 14 Nov 2003; TEKAX: Xayá, 3 Oct 2003; TEKOM: Tekom, 23 Sep 2003; TICUL: Colonia Obrera, 14 Nov 2003, Barrio San Juan, 23 Nov 2003.

Ochlerotatus (Ochlerotatus) sollicitans (Walker)

Material Examined: DZAN: Dzan, 28 Oct 2003; MÉRIDA: Fraccionamiento Magnolias, 21 Nov 2003; TIXKOKOB: Ekmul, 1 Dec 2003; CHEMAX: Sisbichén, 10 Nov 2003.

Ochlerotatus (Ochlerotatus) taeniorhynchus (Wiedemann)

Material Examined: CELESTÚN: Celestún, 7 Oct 2003.

Psorophora (Grabhamia) confinnis (Arribalzaga)

Material Examined: TEKAX: Huntochac, 3 Sep 2003.

Psorophora (Psorophora) howardii Coquillett

Material Examined: TEKAX: Xayá, 3 Oct 2003.

Tribe Culicini

Culex (Culex) bidens Dyar

Material Examined: CHEMAX: Chemax, 4 Oct 2003; DZITÁS: Dzitás, 17 Sep 2003; OXKUTZCAB: Yaxhachén, 6 Nov 2003; SANTA ELENA: Santa Elena, 26 Sep 2003; TIZIMÍN: Tizimin, 6 Nov 2003.

Culex (Culex) coronator Dyar and Knab

Material Examined: ACANCEH: Acanceh, 14 Nov 2003; BOKOBÁ: Bokobá, 8 Sep 2003, 11 Oct 2003; BUCTZOTZ: Buctzotz, 30 Sep 2003, 13-14 Oct 2003; CACALCHÉN: Cacalchén, 11 Sep 2003; CANSAH CAB: Cansahcab, 3 Sep 2003, 18 Dec 2003; CANTAMAYEC: Cantamayec, 2-5, 9-10 Sep 2003, 21-22 Oct 2003; CALOTMUL: Pocoboch, 4 Nov 2003; CHACSINKÍN: Chacsinkín, 11-12, 15 Sep 2003; CHAPAB: Citinecabehén, 4 Sep 2003, 27 Oct 2003; CHEMAX: Chemax, 2 Sep 2003, Kuxeb, 24 Dec 2003, Sisbichén, 10 Nov 2003, Xalau, 3 Nov 2003, 8 Dec 2003; CHICHIMILÁ: Chichimilá, 1-2 Oct 2003; CHIKINDZONOT: Chikindzonot, 11 Sep 2003, 6 Oct 2003; CHUMAYEL: Chumayel, 29 Aug 2003, 2-5, 22 Sep 2003, 10, 14-17 Oct 2003; CHOCHOLÁ: Chochohá, 9 Sep 2003, 8 Dec 2003; CONKAL: Conkal, 8, 10 Sep 2003, Xcuyún (N 21°27'93", W 89°29'36.98"), 27 Aug 2003; CUNCUNUL: Cuncunul, 22 Oct 2003; DZAN: Dzan, 28-29 Oct 2003; DZEMUL: Dzemul, 10 Dec 2003; DZIDZANTÚN: Dzidzantún, 10 Sep 2003, 15 Oct 2003; DZILAM GONZÁLEZ: Dzilam González, 11 Dec 2003; DZITÁS: Dzitás, 17 Sep 2003; ESPITA: Espita, 13 Nov 2003; HALACHÓ: Cuch-Holoch, 17 Sep 2003, Halachó, 27 Sep 2003; HOCABÁ: Hocabá, 19 Sep 2003; HOCTÚN: Hoctún, 10 Nov 2003; HUNUCMÁ: Hunucmá, 26 Aug 2003, 29 Sep 2003, Texan Palomeque (N 20°55'50'37", W 89°49'42.34"), 28 Sep 2003; IZAMAL: Izamal, 1 Sep 2003; KAUA: Kaula, 18 Sep 2003; KANASÍN: Fraccionamiento Héctor Victoria, 30 Oct 2003, Kanasín, 14 Aug 2003, 1 Oct 2003; KANTUNIL: Holcá, 25 Sep 2003; KOPOMÁ: Kopomá, 26 Sep 2003, 8 Dec 2003; MANÍ: Maní, 18 Aug 2003, 1-2 Dec 2003, Tipikal, 10 Dec 2003; MÉRIDA: Colonia Amalia Solórzano, 2 Oct 2003, 30 Sep 2003, Colonia Amapola, 12 Nov 2003, Colonia Benito Juárez, 23 Sep 2003, Colonia Buenavista, 19 Nov 2003, Camara Construcción, 2 Dec 2003, Caucel, 4 Sep 2003, Centro, 24 Nov 2003, Fraccionamiento Chenkú, 26 Nov 2003, Cholul, 4 Sep 2003, 11 Nov 2003, Mérida, 21 Nov 2003, Colonia Sarmiento, 8 Oct 2003, Dzitá, 8 Oct 2003, Colonia Itzimná, 12 Dec 2003, Fraccionamiento Juan Pablo, 15 Dec 2003, Colonia Mulsay, 2 Dec 2003, Colonia Nueva Chichén, 23 Sep 2003, Fraccionamiento San Jose Vergel, 22, 25, 29 Aug 2003, Fraccionamiento Terranova, 21, 28 Nov 2003, Fraccionamiento Vergel, 8 Dec 2003, Fraccionamiento Vergel II, 8 Sep 2003, 25 Nov 2003, Fraccionamiento Vergel III, 8 Dec 2003, Fraccionamiento Vergel IV, 17 Sep

2003, 11 Dec 2003; MUXUPIP: Muxupip, 28 Aug 2003, 18 Sep 2003, 27 Nov 2003; OPICHEN: Calcehtok, 20 Aug 2003; OXKUTZCAB: Cooperativa, 12-14, 18 Nov 2003, Xohuayán, 13 Nov 2003, Yaxhachén, 6, 11-12 Nov 2003; PETO: Peto, 12, 16-17 Sep 2003, Xoy (N 20°7'31.99", W 88°58'48.31"), 2 Oct 2003; PROGRESO: Chicxulub Puerto, 9 Aug 2003, Chuburná Puerto, 19 Sep 2003, Fraccionamiento Campestre Flamboyanes, 18 Sep 2003, Hacienda San Ignacio, 28-29 Aug 2003; SAMAHIL: San Antonio Tedzidz, 27, 31 Oct 2003; SANTA ELENA: Santa Elena, 23-26 Sep 2003; SOTUTA: Sotuta, 20 Oct 2003, Tibolón, 21 Oct 2003; SUMA: Suma, 3 Sep 2003; TAHZDIÚ: Tahdziú, 18, 23, 25, 30 Sep 2003, 5, 9, 13-14 Oct 2003, 3, 6 Nov 2003; TEABO: Teabo, 21-22, 26-29 Aug 2003, 15, 24 Oct 2003; TEKANTÓ: Tekantó, 9 Sep 2003; TEKAX: Huntochac, 3 Sep 2003, Kancab, 6, 25 Nov 2003, Mesatunich (N 19°49'39.59", W 89°25'46.62"), 2 Sep 2003, Pencuyut, 1-2, 7 Oct 2003, San Isidro Maquian, 2 Sep 2003, San Isidro Yaxche (N 19°53'38.75", W 89°26'57.13"), 3 Sep 2003, San Juan Tekax (N 19°43'8.16", W 89°27'1.63"), 27 Aug 2003, Tekax, 19 Sep 2003, Xayá, 1-3, 6-9 Oct 2003, San Pedro Xtoquil (N 19°46'4.24", W 89°26'39.36"), 27 Aug 2003; TEKOM: Tekom, 22-24 Sep 2003; TEMAX: Temax, 13 Nov 2003; TICUL: Colonia Obrera, 17 Nov 2003, Pustunich, 29-30 Sep 2003, 6 Oct 2003, Barrio San Juan, 27 Oct 2003, 3 Nov 2003, Barrio San Román, 24 Nov 2003, Barrio Santiago, 6 Nov 2003, Ticul, 5, 10, 29 Sep 2003, 4 Nov 2003, Yotholin, 29 Sep 2003, 13, 15 Oct 2003; TINUM: Piste, 20-21 Oct 2003; TIXCACALCUPUL: Tixcacalcupul, 24 Sep 2003; TIXKOKOB: Ekmul, 22 Sep 2003, 1-3 Dec 2003, Ruinas de Aké (N 20°56'16.57", W 89°17'50.91"), 2 Dec 2003; TIZIMÍN: Popolnah, 3 Sep 2003, Tizimín, 5-6, 11, 17-19, 24 Nov 2003, 2, 10 Dec 2003; TZUCACAB: Tantankin, 29 Aug 2003, Tzucacab, 1 Oct 2003, 25 Sep 2003, 27, 29 Aug 2003; UAYMA: Uayma, 15 Aug 2003, 15 Oct 2003; UMÁN: Umán, 19 Aug 2003, 5, 8 Sep 2003; VALLADOLID: Valladolid, 17 Aug 2003, 25 Sep 2003, 9 Oct 2003, Xocempich, 27 Nov 2003; XOCHEL: Xochel, 19 Sep 2003; YAXCABÁ: Libre Unión, 9 Dec 2003, Yaxunáh, 7 Oct 2003.

Culex (Culex) interrogator Dyar and Knab

Material Examined: BOKOBÁ: Bokobá, 11 Oct 2003; BUCTZOTZ: Buctzotz, 30 Sep 2003, 13-14 Oct 2003; CANTAMAYEC: Cantamayec, 2 Sep 2003; CELESTÚN: Celestún, 7 Oct 2003; CHAC-SINKÍN: Chaesinkín, 11-12 Sep 2003; CHEMAX: Chemax, 4 Sep 2003, Xalau, 3 Nov 2003, 8 Dec 2003, Kuxeb, 24 Dec 2003; CHIKINDZONOT: Chikindzonot, 11 Sep 2003; CHUMAYEL: Chumayel, 2, 29 Sep 2003, 15-16 Oct 2003; CUNCUNUL: Cuncunul, 2 Oct 2003; DZIDZANTÚN: Dzidzantún, 10 Sep 2003; CHOCHOLÁ: Chocholá, 8 Dec 2003; HUNUCMÁ: Hunucmá, 26 Aug 2003; IZAMAL: Izamal, 1 Sep 2003; KAUA: Kauga, 18 Sep 2003; KANASÍN: Kanasin, 14 Aug 2003, 1 Oct 2003; KANTUNIL: Holcá, 25 Sep 2003; MANÍ: Maní, 28 Nov 2003; MÉRIDA: Colonia Amalia Solórzano, 30 Sep 2003, Colonia Benito Juárez, 23 Sep 2003, Camara Construcción, 2 Dec 2003, Fraccionamiento Chenkú, 27 Dec 2003, Colonia Chichén Itzá, 25 Sep 2003, Cholul, 4 Sep 2003, Mérida, 21 Nov 2003, 3 Dec 2003, Colonia Itzinná, 12 Dec 2003, Fraccionamiento Vergel, 8 Dec 2003, Fraccionamiento Vergel II, 25 Nov 2003, Fraccionamiento Vergel III, 12 Sep 2003; MUXUPIP: Muxupip, 18 Sep 2003, 27 Nov 2003; OPICHEN: Calcehtok, 20 Aug 2003; OXKUTZCAB: Cooperativa, 14 Nov 2003, Yaxhachén, 6, 12 Nov 2003; PETO: Xoy, 2 Oct 2003; PROGRESO: Chicxulub Puerto, 9 Aug 2003, 9 Sep 2003; SOTUTA: Tibolón, 21 Oct 2003; TAHZDIÚ: Tahdziú, 18 Sep 2003; 5, 9 Oct 2003, 9, 12 Nov 2003; TEABO: Teabo, 21-22 Aug 2003, 14-15 Oct 2003; TEKAX: Kancab, 25 Nov 2003, San Isidro Maquian, 2 Sep 2003, San Juan Tekax, 27 Aug 2003, Xayá, 1-3 Oct 2003; TEKOM: Tekom, 22 Sep 2003; TICUL: Pustunich, 29 Sep 2003, Barrio San Juan, 3 Nov 2003, Yotholin, 29 Sep 2003, 15 Oct 2003; TIXKOKOB: Ekmul, 1-2 Dec 2003; TIZIMÍN: Tizimin, 6, 19 Nov 2003, 10-11 Dec 2003; UAYMA: Uayma, 10 Sep 2003; UMÁN: Umán, 9 Sep 2003; VALLADOLID: Valladolid, 25 Sep 2003, 26 Nov 2003.

Culex (Culex) nigripalpus, Theobald

Material Examined: ACANCEH: Acanceh, 14 Dec 2003; BUCTZOTZ: Buctzotz, 30 Sep 2003, 13-14 Oct 2003; CANSAH CAB: Cansaheab, 18 Dec 2003; CANTAMAYEC: Cantamayec, 2, 8-9 Sep 2003, 22 Oct 2003; CELESTÚN: Celestún, 4 Oct 2003; CHACSINKÍN: Chaesinkín, 11-12, 15 Sep 2003; CHAPAB: Citineabchén, 4 Sep 2003; CHEMAX: Chemax, 2 Sep 2003, Xalau, 8 Dec 2003; CHICHIMILÁ: Chichimilá, 2 Oct 2003; CHUMAYEL: Chumayel, 2-3 Sep 2003; CUNCUNUL: Cuncunul, 22 Oct 2003; DZAN: Dzan, 28 Oct 2003; DZIDZANTÚN: Dzidzantún, 15 Oct 2003;

DZITÁS: Dzitás, 17 Sep 2003, 23 Oct 2003; HOCABÁ: Hocabá, 19 Sep 2003; HOCTÚN: Hochtún, 10 Nov 2003; KAUA: Kauga, 18 Sep 2003; KANASÍN: Fraccionamiento Héctor Victoria, 30 Oct 2003; KANTUNIL: Holcá, 25 Sep 2003; MÉRIDA: Colonia Amapola, 12 Nov 2003, Colonia Buenavista, 19 Nov 2003, Centro, 10 Oct 2003, Fraccionamiento Chenkú, 26 Nov 2003, Colonia Chichén Itzá, 25 Sep 2003, Mérida, 21 Nov 2003, Dzityá, 8 Oct 2003, Colonia Itzimmá, 12 Dec 2003, Fraccionamiento Lindavista, 17 Nov 2003, Fraccionamiento Residencial Pensiones, 16 Oct 2003, Fraccionamiento Vergel, 3, 8 Dec 2003, Fraccionamiento Vergel II, 4 Dec 2003, Fraccionamiento Vergel III, 8-9 Dec 2003, Fraccionamiento Vergel 65, 5 Dec 2003; MUXUPIP: Muxupip, 27 Nov 2003; OPICHEN: Calcehtok, 20 Aug 2003; OXKUTZCAB: Yaxhachén, 12 Nov 2003; SAMAHIL: San Antonio Tedzidz, 27 Oct 2003; SANTA ELENA: Santa Elena, 25 Sep 2003; SOTUTA: Sotuta, 20 Oct 2003; TAHDZIÚ: Tahdziú, 21 Sep 2003; TAHMEK: Tahmek, 5, 9, 14 Oct 2003, 5-6 Nov 2003; TEABO: Teabo, 21 Aug 2003, 10 Oct 2003; TEKAX: San Isidro Maquian, 2 Sep 2003, Tekax, 19 Sep 2003, Xayá, 1-3 Oct 2003; TEKOM: Tekom, 22 Sep 2003; TEMAX: Temax, 13 Nov 2003; TICUL: Colonia Obrera, 14 Nov 2003, Barrio San Román, 10 Nov 2003, Barrio San Juan, 3 Nov 2003; TINUM: Piste, 20 Oct 2003; TIXCACALCUPUL: Tixcacalcupul, 24 Sep 2003; TIXKOKOB: Ekmul, 1-2 Dec 2003; TIZIMÍN: Tizimín, 5-6, 19 Nov 2003, 11 Dec 2003; VALLADOLID: Valladolid, 22, 25 Sep 2003, Xocempich, 27 Nov 2003; XOCHEL: Xochel, 19 Oct 2003; YAXCABÁ: Yaxunáh, 7 Oct 2003.

Culex (Culex) quinquefasciatus (Say)

Material Examined: BUCTZOTZ: Buctzotz, 13 Oct 2003; CANTAMAYEC: Cantamayec, 2, 5, 10 Sep 2003; CELESTÚN: Celestún, 26 Aug 2003, 3, 6-7 Oct 2003; CHACSINKÍN: Chacsinkín, 15 Sep 2003; CHAPAB: Citincabchén, 4 Sep 2003, 27 Oct 2003; CHEMAX: Chemax, 4 Sep 2003; CHICHIMILÁ: Chichimilá, 1, 15 Oct 2003; CHUMAYEL: Chumayel, 24 Aug 2003, 3 Sep 2003, 15 Oct 2003; CÚNCUNUL: Cuncunul, 22 Oct 2003; DZIDZANTÚN: Dzidzantún, 15 Oct 2003; DZILAM GONZÁLEZ: Dzilam González, 11 Oct 2003; DZITÁS: Dzitás, 17 Sep 2003; ESPITA: Espita, 13 Nov 2003; CHOCHOLÁ: Chocholá, 8 Dec 2003; HOCABÁ: Hocabá, 19 Sep 2003; HUNUCMÁ: Hunucmá, 26 Aug 2003; KAUA: Kauga, 18 Sep 2003; KANASÍN: Kanasín, 14 Aug 2003, 1 Oct 2003; KOPOMÁ: Kopomá, 26 Sep 2003; MANÍ: Maní, 2 Dec 2003; MÉRIDA: Colonia Amalia Solórzano, 30 Sep 2003, Colonia Amapola, 12 Nov 2003, Colonia Benito Juárez, 23 Sep 2003, Caucel, 4 Sep 2003, Centro, 24 Nov 2003, Fraccionamiento Chenkú, 26 Nov 2003, Colonia Chichén Itzá, 25 Sep 2003, Cholul, 4 Sep 2003, Mérida, 21 Nov 2003, 3 Dec 2003, Colonia Itzimmá, 12 Dec 2003, Fraccionamiento Lindavista, 7 Nov 2003, Fraccionamiento Vergel, 11 Sep 2003, Fraccionamiento Vergel I, 5 Dec 2003, Fraccionamiento Vergel II, 25 Nov 2003, 4 Dec 2003, Fraccionamiento Vergel III, 12 Sep 2003, 5, 9-8 Dec 2003, Fraccionamiento Vergel 65, 11 Sep 2003, 5 Dec 2003, Colonia Vicente Solís, 15 Sep 2003; MUXUPIP: Muxupip, 27 Nov 2003, 18 Sep 2003, 28 Aug 2003; OPICHEN: Calcehtok, 20 Aug 2003; OXKUTZCAB: Cooperativa, 13 Nov 2003, Yaxhachén, 6 Nov 2003; PETO: Peto, 12 Sep 2003; PROGRESO: Chuburná Puerto, 19 Sep 2003, Fraccionamiento Campestre Flamboyanes, 18 Sep 2003, Hacienda San Ignacio, 29 Aug 2003, Progreso, 2 Oct 2003; RÍO LAGARTOS: Río Lagartos, 12 Nov 2003; SAMAHIL: San Antonio Tedzidz, 27 Dec 2003; SANTA ELENA: Santa Elena, 23-26 Sep 2003; SOTUTA: Sotuta, 20-21 Oct 2003, Tíbolón, 21 Oct 2003; TAHDZIÚ: Tahdziú, 19 Sep 2003; TAHMEK: Tahmek, 5, 9, 13-14 Oct 2003, 5-6, 9 Nov 2003; TEABO: Teabo, 21-22, 27 Aug 2003, 10, 14-15, 24 Oct 2003; TEKANTÓ: Tekantó, 9 Sep 2003; TEKAX: Huntochac, 3 Sep 2003, Xayá, 2-3 Oct 2003; TEKIT: Tekit, 8 Nov 2003; TEKOM: Tekom, 22 Sep 2003; TICUL: Pustunich, 29-30 Sep 2003, Barrio San Juan, 3, 8 Nov 2003, Barrio San Román, 8 Nov 2003, Fraccionamiento Santamaria, 3 Nov 2003, Barrio Santiago, 7 Nov 2003, Ticul, 5 Sep 2003, 30 Oct 2003, 12 Nov 2003, Yotholín, 29 Sep 2003; TIXKOKOB: Ekmul, 22 Sep 2003, 1-3 Dec 2003; TIZIMÍN: Popolnah, 3 Sep 2003, Tizimín, 6, 17, 19 Nov 2003, 1-2, 10-11 Dec 2003; UMÁN: Umán, 19 Aug 2003, 5, 9 Sep 2003; YAXCABÁ: Libre Unión, 9 Dec 2003.

Culex (Culex) thriambus Dyar

Material Examined: BOKOBÁ: Bokobá, 8 Sep 2003, 11, 14 Oct 2003; CACALCHÉN: Cacalchén, 11 Sep 2003; CANSAHAB: Cansahab, 3 Sep 2003; CANTAMAYEC: Cantamayec, 2, 5, 10 Sep 2003; CELESTÚN: Celestún, 26 Aug 2003; CHACSINKÍN: Chacsinkín, 12 Sep 2003; CHEMAX: Chemax, 4 Sep 2003; CHIKINDZONOT: Chikindzonot, 11 Sep 2003; CHUMAYEL: Chumayel, 2 Sep

2003; DZIDZANTÚN: Dzidzantún, 10 Sep 2003; DZITÁS: Dzitás, 17 Sep 2003; HALACHÓ: Cuch-Holoch, 17 Sep 2003, Halachó, 17, 27 Sep 2003; HUNUCMÁ: Hunucmá, 2, 26 Aug 2003, 9 Sep 2003, Texam Palomeque, 28 Sep 2003; IZAMAL: Izamal, 1 Sep 2003; KANASÍN: Kanasin, 14 Aug 2003, 1 Oct 2003; KANTUNIL: Holcá, 25 Sep 2003; KOPOMÁ: Kopomá, 26 Sep 2003; MÉRIDA: Colonia Amalia Solórzano, 30 Sep 2003, 1 Oct 2003, Colonia Benito Juárez, 23 Sep 2003, Caucl, 4 Sep 2003, Cholul, 4 Sep 2003, Colonia Miraflores, 18 Aug 2003, Mérida, 3 Dec 2003, Colonia Nueva Chichén, 23 Sep 2003, Fraccionamiento San Jose Vergel, 22, 25 Aug 2003, Fraccionamiento Vergel, 10-11 Sep 2003, Fraccionamiento Vergel II, 8, 21 Sep 2003, Fraccionamiento Vergel III, 12-11 Sep 2003, Fraccionamiento Vergel IV, 17 Sep 2003, Fraccionamiento Vergel 65, 11 Sep 2003; MOTUL: Motul (N 21°44'1.14", W 89°16'41.48"), 21 Aug 2003; MUXUPIP: Muxupip, 28 Aug 2003, 18 Sep 2003; OPICHEN: Calcehtok, 20 Aug 2003; OXKUTZCAB: Cooperativa, 14 Nov 2003, Yaxhachén, 6, 11 Nov 2003; PROGRESO: Chicxulub Puerto, 9 Aug 2003, Chuburná Puerto, 19 Sep 2003, Fraccionamiento Campestre Flamboyanes, 18 Sep 2003, Progreso, 2 Oct 2003, Hacienda San Ignacio, 28-29 Aug 2003; SAMAHIL: San Antonio Tedzid, 27 Oct 2003; SANTA ELENA: Santa Elena, 23 Sep 2003; SUMA: Suma, 3 Sep 2003; TAHDZIÚ: Tahdziú, 18, 21, 23 Sep 2003; TEABO: Teabo, 22 Aug 2003; TEKANTÓ: Tekantó, 9 Sep 2003; TEKAX: Xayá, 3, 9 Oct 2003; TICUL: Carretera Estatal, 26 Sep 2003, Barrio San Juan, 3, 15 Nov 2003, Yotholín, 13 Oct 2003; TIXKOKOB: Ekmul, 22 Sep 2003, 3 Dec 2003; TIXMEHUAC: Chicam, 24 Oct 2003; UMÁN: Umán, 19 Aug 2003, 5, 9 Sep 2003.

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